Modeling of Ecoconditions of the Ground Atmosphere with Additional Information of Intermediate Measurements

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Abstract:- *Occurrence of an opportunity of fast distant measurements and a fast processing of the received information expend area of applicability of the net spaces of conditions, the method of connected task, and a method of splitting of operators. If the time (τ) of measurement and processing much less than other characteristic times (τ_c) of processes considered in the atmosphere, the combination of quasicontinuous measurements with the subsequent processing the receiving results is possible to put various individual and intermediate tasks for reception of the additional information. For example, of such task in the present report distribution of heavy (aerosol) particles in a ground atmosphere is studded.*

The space is broken into intervals ("points") with the sizes 3x3x3m³, in measurement is made from distances up to 5 km. In an interval of time (τ, τ_c) it is considered a task with stationary boundary conditions, and an interval (τ_c, t) a dynamic task, were t-is current time. It is measured both spatial distribution, and integrated quantity of aerosols, considering as characteristic functional.

In result condition of Lagrange gives additional, generally speaking, the ambiguous information on the connected tasks. The algorithm of the program for determination of aerosol's distribution which is considered as the entry condition for the another-more general task is made.

We shall make simultaneous splitting of the evolution operator of a full task on the components and coordinates. Steady convergence of numerical calculation is provided with the help of small (τ_p), besides $\tau_p < \tau$, were τ_p-is stepping interval at the numerical counting.

Keywords:- *correction models by distant quazicontinued measurements, characteristic times, theoretical–experimental modeling.*

1. INTRODUCTION

Maintenance of a correctness of modeling of modeling of processes in ground atmosphere is one of difficult problem of a modern scince.

Really, available us the initial information is not enough for a correctness of model. And not only because any physical model is rough and simplified, but also because even these simplified, magnetic–hydrodynamical models are represented by incorrectly determined parameters. For example, thermodynamic sizes, temperature and pressure of air weight, or speed of movement of this weight the borrowed concepts which for the given problem difficulty give in to correct and precise definition, or even in used interpretation (it is especial in strongly no equilibrium condition). Therefore, speech cannot go about accuary of definition of indistinct sizes. Differently, the specified incorrectness of models has methodical character and is basic difficulty. Synoptic atmospheres given about a condition are average on time and on space, therefore carry the insufficient information. The exact task of fields of pressure, temperatures and speeds, when quantity of the information maximal, it again insufficiently for full specification of model. As the specified borrowed parameters have static character, hence, it is necessary to take into account also fluctuations of factors appeared in model, external fluctuations.

Influences of both: internal and external fluctuations in strongly no equilibrium condition can appear deciding. The considered tasks on stability concerning fluctuation are necessary, but do not remove an incorrectness. Caused by an illegibility of the definition, describing, a condition of system, sizes.

First of all, it affects at numerical modeling or at a combination of numerical calculations with measurements. In such cases or it is necessary to cease to use such it is inexact in the certain sizes, or it is necessary to count them formal parameters for representation of a condition of system. In the latter

case there is a necessity of individual specification of effective values of these formal parameters by measurement and calculations.

These specification play a role of some, as though "returing force". We shall adhere here to such approach.

2. MODELING OF ECOCONDITIONS OF ATMOSPHERE BY USING OF INTERMEDIATE MEASUREMENTS

With this purpose we shall consider work of the circuit, is showing on fig.1.

The circuit is intended for remote monitoring of condition of the atmosphere (SA) and represents adjusting combined method of measurement. This purpose is achieved by use trial control of substant (TKS) as a data carrier about SA, or about the sizes determining SA. On the other hand TKS gets out so that substant had rather well developed physical, mathematical and numerical models and precisely enough and easily aerosols, the smoke emissions, specially entered components and etc., for which for a long time are developed models [1, 2] and measuring means (see, for example, gave in to measurement). TKS can become [3, 4]. In a basis of a method of the measurements, the submitted circuit on fig.1, that circumstance that exist a number of parameters and sizes which appear in both models–TKS and SA lays.

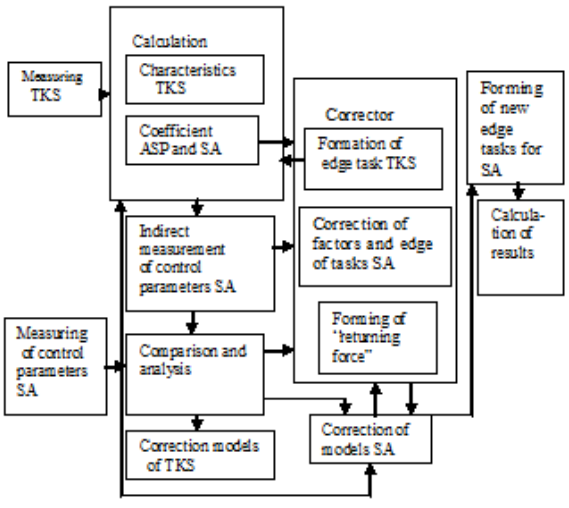

Fig.-1: Block-shame of measurement and processing of results.

Then, even if these characteristic have formal or authorized character their knowledge for one of these models, frequently allows torestore corresponding characteristics of other model [1, 2]. Increases of speeds of measurement and calculation allow to transform this circumstance into self-correcting method of measurement. Thus the models describing factors and parameters, and also initial and boundary conditions of tasks are corrected In the circuit there are two blocks for carrying out of direct measurements radiometric and spectral characteristics from distance 5km from sources of radiation in the sizes $3x3x3m^3$. Both blocks of measurement in a data-bank of a computer are formed in time τ_N. The block of measurement TKS forms a full data set for restoration on the given model of all distributions TKS. And the block of measurement SA determines only control values of some parameters. In time τ_p the block of calculation on the given measurements and chosen models TKS and SA define condition TKS, and also parameters and factors of model SA.

By the received results indirect measurements (i.e. values are formed) of control parameters SA which also have been measured directly are made there is a comparison and the analysis of results of direct and indirect measurements. On the basis of this analysis correction of model TKS with the subsequent trans-far to the block of calculation (the first feedback) is made. By all these results in the block of correction of model TKS, counted factors SA is made, are formed "returning forces" and regional problem SA, with the subsequent correction of model SA. Two feedback are specified by arrow B and C, and on the basis of the saved up measuring and computing data the new regional problem for SA is formed.

Certainly, we could use only the part of this circuit concerning to TKS, and to consider only this individual problem.

The block of indirect measurements (through trial control substant (TKS) is necessary for formation of "returning forces of correction" TKS.

Work of the circuit 1 periodic with the period τ, hence the block–proof-reader adjusts a feedback.

On the other hand the block of comparison adjusts other feedback for correction of models.

The essence of the offered method illustrated on the qualitative Fig. 2, consists in the following: schedules conditions describing evolution, we shall tell "phase trajectories", express properties as conditions, and its chosen working model. If trajectories do not run up, action of the circuit 1will simply ratify this circumstance, not bringing any changes. In a case run up the circuit 1through time τ returns a trajectory in the true condition (for example, from B in A, from D in C, etc.).

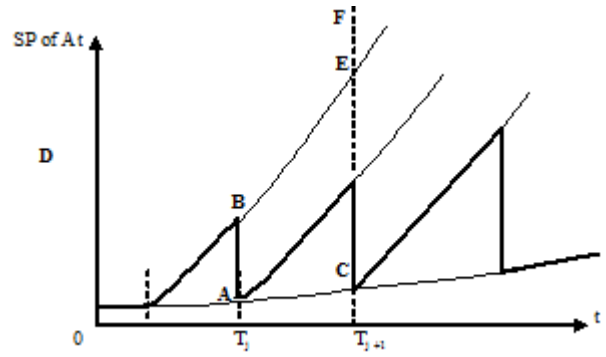

Fig. -2: Diagram of trajectories dependence from parameters of atmosphere's states (SP of At-some parameters of atmosphere).

In result true the trajectory is replaced it quazicontinued with approximation (notched a fat line on the diagram). It is obvious, that on many properties, for example, stability, this approximation more successful.

3. CONCLUSION

In case of numerical modeling bilateral approximation on a basis difference the circuit with splitting operators of mathematical model, it is possible to achieve accuracy τ^2 bit. Hence, accuracy of method quazicontinious self–updating too has such order of accuracy.

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